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THE LEVEL OF INFESTATION WITH THE VECTOR OF CATTLE BABESIOSIS IN ARGENTINA

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Studies were carried out to determine the differential aptitude to sustain the only vector of cattle babesiosis in Argentina, the tick Boophilus microplus, *throughout the infested region of this country. Tick counts on* Bos taurus *cattle were used as the main criterion to classify favourable (F), intermediate (I) and unfavourable (U) areas for its development. The geographical limits of each area were set up using data of non-parasitic tick stages, temperature, water balance and map recognition of flooded and unflooded zones. The F area contained 16.5 x 10^6 ha with a cattle population of 6 x 10^6; the I and U areas had 25 x 10^6 ha with 2.7 x 10^6 cattle and 19 x 10^6 with population of 2.4 x 10^6 cattle, respectively. Research on the relationship amongst* Babesia-Boophilus-*cattle is needed in the F area for tick development which coincides with the best region for cattle breeding.*

Key word: *Boophilus microplus* – Argentina – level of infestation – climate – cattle population

As in other countries with extensive tropical and subtropical areas, ticks and tick-borne disease are an important constraint to the Argentinian cattle industry. The combined effect of babesiosis (*Babesia bovis* and *Babesia bigemina*) and its vector, the common cattle tick *Boophilus microplus*, causes a loss of over 100 million US$ annually to the economy of the country (Späth et al., 1990). Accordingly studies have been carried out to know the ability of *B. microplus* populations to develop in various localities of the infested region. Some of them emphasized on the non-parasitic tick stages (Ivancovich et al., 1982, 1984) while others stressed on the tick numbers on cattle (Mangold et al., 1985; Ivancovich, 1989; Guglielmone et al., 1990a).

Nevertheless there is no quantitative information on the differential aptitude to sustain *B. microplus* considering the whole area infested. This article refers to this aspect of the problem taking into account the cattle population of the areas with dissimilar natural conditions for tick development.

MATERIALS AND METHODS

Favourable (F), intermediate (I) and unfavourable (U) areas for the development of *B. microplus* were determined using as the main criterion the level of infestation with *B. microplus* females 4.5-8.0 mm length (Wharton & Utech, 1970) on *Bos taurus* cattle. The average number of ticks adjusted to the whole body of cattle and seasons of the year from 11 farms of the infested region (Guglielmone et al., 1981; 1990a,b; Ivancovich, 1989; Mangold et al., 1985; 1987) was used to this aim. Tick counts were performed on British *B. taurus* in farm 11 and in British and Spanish *B. taurus* in farm 10 (farm numbers and locations are specified in Table I). Other farms had "regional" type of cattle, originated from uncontrolled crosses between British and Spanish *B. taurus*. All herds grazed on natural native pastures with the exception of farm 10 where perennial (mainly *Chloris gayana*) and annual (oat and sorghum) pastures have been incorporated.

A combination of biological and chemical tick control methods were applied in farm 10. This consisted in two cattle treatments per year with an organic phosphorus compounds plus the use of sorghum and oat. These annual pastures were consumed in about 60 days, therefore the cattle were removed before the time that the progenies of the engorged female ticks dropped from them infested the pastures. One herd of farm 11 received 9 treatments yearly with an organic phosphorous compound while another herd remained untreated. No measures against ticks were carried out in the other farms.

Farms with a maximum cattle infestation between 150 and 449 ticks were considered I for tick development. Farms with maximum tick burdens below and above those limits were classified as U and F for *B. microplus*, respectively.

The geographical limits for the areas were set up using the data of non-parasitic tick stages (Ivancovich et al., 1982; 1984); water balance; mean monthly temperature (Failde, 1987) and map recognition of flooded and unflooded lands.

Sites with at least four generations of *B. microplus* yearly were considered F for tick development but when the average maximum survival of the unfed larvae was less than 45 days the site was classify as I. Annual water deficits > 200 mm were judged F for this tick species, while those deficits within the range of 200 to 500 mm or > 500 were considered I and U for tick development, respectively. Areas with no more than a month per year with a mean monthly temperature < 14.5 °C were considered F. Flooded lands were determined as U for the development of *B. microplus*.

Cattle population for the different areas were obtained using the numbers of cattle per district of the tick infested area of each Province (Argentina, 1978).

RESULTS

The coordinates, stocking rates, mean numbers of ticks on cattle per seasons of the year and the classification for tick development of the 11 farms are presented in Table I. The geographical distribution of the areas F, I and U for *B. microplus*, and their sub-areas are shown in the Figure. The size of the F, I and U areas for tick development and their cattle populations are presented in Table II.

With the exception of a small zone of little importance for the cattle industry in the northwest corner of the infested region, the area F for *B. microplus* was located in the east of the region.

The I area for tick development was formed by two sub-areas. One corresponds to valleys with altitude between 1000 and 1400 m, and rain forest south to the tropic in northwestern Argentina where water balance was appropriate for the cycle of *B. microplus* but winter

TABLE I

Coordinates, classification for tick development, stocking rates (SR) and mean numbers of *Boophilus microplus* female ticks on cattle per season of the year in 11 Argentinian farms

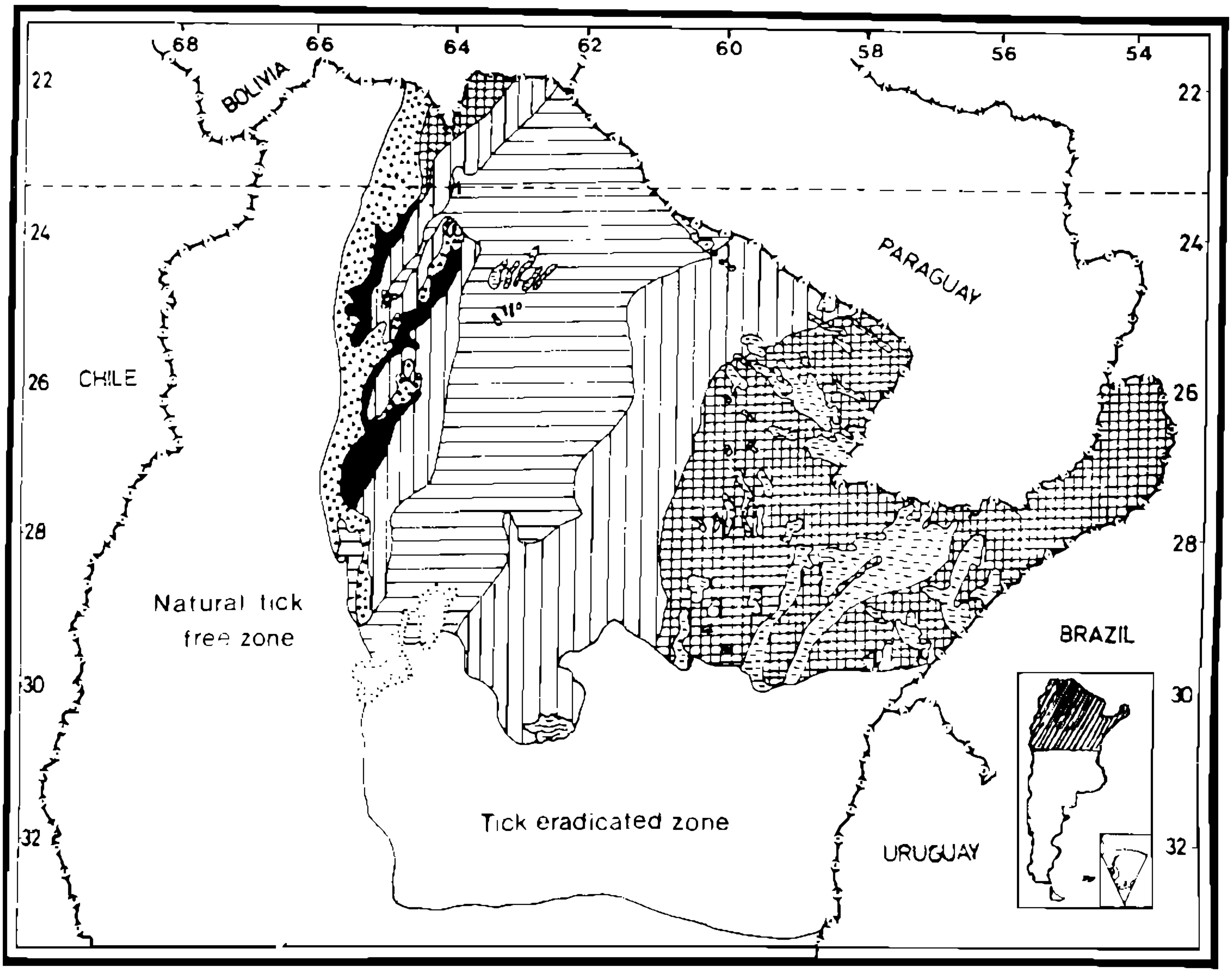
Farm	Coordinates				Tick	SR[a]	Mean number of ticks			
No.	o	S	o	W	development		Summer	Fall	Winter	Spring
1	28	38	65	08	Unfavourable	12	< 1	6	0	0
2	24	54	63	34	Unfavourable	15	14	28	59	82
3	25	41	65	36	Unfavourable	4	29	99	11	3
4	29	22	63	29	Intermediate	6	1	160	9	3
5	25	03	65	35	Intermediate	5	17	166	109	63
6	25	02	64	58	Intermediate	7	72	195	161	74
7	28	27	62	50	Intermediate	10	36	330	4	49
8	26	06	65	01	Intermediate	5	36	400	59	4
9	26	41	61	50	Intermediate	8	42	410	37	314
10[b]	27	12	65	18	Intermediate	1.5	101	45	37	40
10[c]	27	12	65	18	Intermetiate	1.5	409	106	19	101
11[d]	26	18	59	23	Favourable	3	144	256	33	60
11[e]	26	18	59	23	Favourable	3	231	649	228	146

a: Ha per cattle unit.
b: Spanish *B. taurus*.
c: Bristish *B. taurus*.
d: Herd treated against ticks.
e: Untreated herd.

TABLE II

Size and cattle population in the areas favourable, intermediate and unfavourable for the development of *Boophilus microplus* in Argentina

	Size (ha x 10^6)	% of the total	Cattle population (x 10^6)	% of the total
Favourable	16.5	27.3	6.0	54.5
Intermediate	25.0	41.3	2.7	24.1
Unfavourable	19.0	31.4	2.4	21.4
Total	60.5		11.1	



Geographical distributioin of *Boophilus microplus* in Argentina. Favourable area: annual water deficit < 200 mm: ≤ 1 month yearly with mean temperature < 14.5 °C (▦). Intermediate area: A - Water deficit < 200 mm yearly; 3-4 months per year with mean temperature < 14.5 °C (■). B - annual water deficit between 200-500 mm; < 3 months with mean temperature < 14.5 °C (▥). Unfavourable area: A - Water deficit < 500 mm annually: < 4 months per year with mean temperature < 14.5 °C (▤). B - Annual water deficit < 200 mm; > 4 months with temperature < 14.5 °C per year (⬚). C. - Flooded lands (▤).

temperatures too low for it. The other sub-area was situated in zones with temperatures, generally, according with the requirements of this tick species but water deficit > 200 m annually. Five tick generations can be produced yearly in the north of this sub-area, however the average maximum longevity of the tick larvae at 25° 25 S 59° 35 W was 41 days; larvae from engorged female exposed in tubes of bronze during January had an average longevity of 16 days.

The U area was formed by three sub-areas. One of them was located in the mountainous zone that is the west boundary of the area infested with

B. microplus. This species of tick has been found up to an altitude of 2200 m in this sub-area but the climate was too cold to sustain a build up of the tick population. Another sub-area was situated in a semi-desertic zone in the central part of the infested region. The third sub-area comprises flooded lands of the Argentinian mesopatamy within the F area for tick development.

DISCUSSION

The study was performed mainly with data from places where the cattle industry is rather primitive. This provided proper condition to learn about the abundance of *B. microplus* when there are few interferences of man practices between cattle and ticks.

The farm 10 had the highest stocking rate of the 11 farms studied due to the incorporation of pastures. The increased ability of the land to sustain cattle also increases the chances of the *B. microplus* larvae to find a host. This was particularly evident in the British *B. taurus*, which are considered low resistant to ticks (Utech et al., 1978; Guglielmone et al., 1990b); their tick loads were high considering the implementation of measures to control them. On the other hand Spanish *B. taurus* (farm 10) showed a lower level of tick infestation than the British ones, probably due to resistance to *B. microplus* arisen from a long association with a related tick species, *Boophilus annulatus*, in the Iberian Peninsula (Wharton & Norris, 1980).

The maximum tick numbers were found during the autumn in the herds were acaricides have not been applied, with the exception of farm 2 where the highest tick load occurred in the spring. A similar phenomenon has been detected in at least one year in farms 6 (Guglielmone et al., 1990a) and 9 (Mangold et al., 1987). These places are characterized by a severe shortage of water and forage at the end of the dry season which coincides with the spring. Poor nutrition of cattle weakens their resistance to *B. microplus* (Sutherst et al., 1983); this along with a seasonal increase of the stocking rate around watering places, could be responsible for the peak of tick abundance during the spring.

The biggest part of the area U for the vector of cattle babesiosis corresponded to the semi-desertic region in north-central Argentina. Ivancovich (1973) studied the north part of this region and stated that *B. microplus* barely survives in the surroundings of habitats with water all year round from where it can spread when climatic conditions are appropriate for its life cycle.

The majority of the cattle population in the infested region was concentrated in the area F for tick development. Nevertheless the epizootiology of cattle babesiosis, the most important disease of cattle transmitted by *B. microplus* in Argentina, has been only studied in the north-west of the country, amongst others by Habich et al. (1982), Ríos (1987) and Aguirre et al. (1990). The veterinary practitioners of the F area for *B. microplus* claim that babesiosis is becoming a relevant problem to the cattle industry. A few laboratory diagnosis showed that *B. bovis* was involved in some of the outbreaks. Obviously research on the relationship amongst *Babesia-Boophilus*-cattle is needed in this important Argentinian region for cattle breeding.

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